channels are significant to the railroads for a number of reasons. First, contiguous railroad channels facilitate efficient frequency coordination and ease in detection and resolution of interference. If adjacent channels were used by other PLMR users not coordinated by AAR, it would create additional administrative problems in the event of interference. Immediate detection and correction of interference is essential to the safety of railroad operations.

Second, loss of contiguous channels dedicated to railroad use would severely limit the railroads' flexibility to utilize more efficient and advanced technologies, particularly Time Division Multiple Access ("TDMA"). If existing railroad channels convert to narrowband,[13] and adjacent channels were licensed to other PLMR users, the railroads would be unable to "stack"[14] narrowband channels to obtain the bandwidth necessary for alternative technologies that require more spectrum. With contiguous spectrum, stacking channels would be possible even if adjacent channels were assigned to different railroad companies. The mutual cooperation that exists within the railroad industry,

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[12] (...continued)
contiguous spectrum is the Commission's proposal to make every third 5 kHz narrowband channel available for regional wide-area voice and data applications, as discussed in Section VI.

[13] The proposed narrowband channels of 5 kHz and 6.25 kHz would be unable to accommodate alternative technologies requiring wider bandwidths.

[14] "Stacking" is used in this context to refer to combining adjacent channels to achieve greater bandwidth.

as facilitated by AAR, would enable the railroads to "swap" channels when necessary to implement alternative technologies such as TDMA, as well as other technologies that may become available in the future.

IV. THE COMMISSION SHOULD CONTINUE TO EXPLORE AND PERMIT USERS TO IMPLEMENT ALTERNATIVE MEANS OF RELIEVING CONGESTION AND ACHIEVING SPECTRUM EFFICIENCY.

The Commission's "refarming" proceeding has produced a variety of approaches to alleviate spectrum congestion and achieve spectrum efficiency by PLMR users. Although much attention has focused on the Commission's proposal to convert existing channels to narrower bandwidths, other alternatives with great potential for achieving spectrum efficiency also have been proposed and discussed by the Commission, PLMR users and equipment manufacturers. As discussed in Section V, the Commission's narrowband conversion plan will yield minimal efficiency gains while imposing enormous costs on users. Thus, at this relatively early stage in the "refarming" process, it is essential that the Commission continue to explore all alternatives, including trunking and a "green space," or separate spectrum block for very narrowband channels. Further, the Commission should make every effort to provide users the flexibility to implement those techniques that best suit their needs.

A. AAR Supports the Commission's Proposal to Permit Immediate Use of Trunking Technologies.

AAR supports the Commission's proposal to permit centralized trunking immediately upon adoption of final rules in this proceeding. NPRM, 7 FCC Rcd at 8114. Trunking is an extremely viable means of achieving spectrum efficiency. The Commission has long recognized that, although relatively expensive to implement, trunked systems maximize spectrum efficiency and further the public interest. See "Land Mobile Services," Memorandum Opinion and Order, 51 FCC 2d at 983-84. Permitting trunking immediately upon adoption of rules in this proceeding would entice users to move to more spectrum efficient techniques based on expanded user feature sets that typically are available with most trunking systems.

Trunking is especially attractive to the railroads because the industry consists of a relatively small, homogenous group of users. With AAR as coordinator and with reassignment of users via trunking, the railroads could stack the frequencies necessary for implementing alternative wideband modulation techniques such as TDMA.

Further, trunking is desirable as a spectrum efficiency [redacted]

could communicate at both locations utilizing the same mobile unit.

Given the great potential of trunking to increase spectrum efficiency, the Commission must ensure that users' ability to implement trunking is not impeded.

B. AAR Supports Making Available a "Green Space" Spectrum Block With Only Very Narrow Channels for PLMR Users Without Wideband Requirements.

AAR believes it is essential that the Commission preserve sufficient wideband channels for users to implement the many emerging specialized radio applications involving transmission of voice plus data. One major problem with the Commission's plan to convert PLMR spectrum to very narrowband is that it precludes use of advanced technologies that require wider channels. Not all PLMR user groups, however, currently utilize their assigned channels for data applications or plan to in the future. For example, a great number of users, such as pizza delivery services, plumbing contractors, farmers and construction site workers, use voice-only PLMR service, which can be supported on narrower channels such as the 5 kHz and 6.25 kHz channels the Commission has proposed. Voice-only channels are not sufficient, however, to meet the needs of other industries, such as the railroads, with more complex operational requirements. Thus, rather than impose a very narrowband channel plan on all PLMR frequencies, it would make sense to set aside a separate block of

spectrum with narrower channels and make it available for users with voice-only requirements.

Ralph Haller, Chief of the Private Radio Bureau, recognized the benefits of this approach at the Commission's May 6, 1993, public hearing on "refarming." Mr. Haller suggested that a new "green space," or clear spectrum with very narrowband channels, be made available for voice-only users. The frequencies to which these voice-only users currently are assigned would then be freed up for other PLMR users. The availability of additional channels would alleviate the need to impose a mandatory very narrowband channel plan on all PLMR frequencies. Users with data requirements would be able to retain sufficient bandwidth to implement data transmission technologies.

Allocating a "green space" with very narrowband channels would be consistent with the Commission's allocation of the 220-222 MHz frequencies for narrowband use.[15/] In that proceeding, the Commission recognized that a narrowband channel plan is much more likely to be successful if implemented on clear spectrum rather than on fully occupied wider channels.

The lack of an immediately available block of clear spectrum should not deter the Commission from continuing to explore this alternative. Spectrum efficient technologies for all radio-based services will continue to become available in the next decade, freeing up additional spectrum. At least 200 MHz of

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15/ Report and Order, 3 FCC Rcd 5287 (1988) recon. denied, 4 FCC Rcd 6407 (1989).

underutilized federal government spectrum likely will become available as well.[16/] Moreover, as the Commission has done in the past, it may determine that spectrum can be reallocated for a PLMR "green space" if existing licensees can convert to alternative technologies or be accommodated on other frequencies. See, e.g., First Report and Order and Third Notice of Proposed Rule Making, 7 FCC Rcd 6886 (1992) (reallocating 2 GHz frequencies for emerging technologies and providing for relocation of existing fixed microwave licensees, including railroads) and Second Report and Order, 6 FCC Rcd 6792 (1991) (adopting plan for relocating Instructional Television Fixed Service licensees from frequencies reallocated for Multipoint Distribution Service).

V. THE COMMISSION SHOULD ADOPT A PLAN FOR CONVERSION TO NARROWBAND THAT GUARANTEES IMMEDIATE EFFICIENCY GAINS AND MINIMIZES BURDENS ON USERS.

The Commission's primary proposal for increasing spectrum efficiency in the PLMR bands is to reduce channel spacing and require users to convert to very narrowband technology. NPRM, 7 FCC Rcd at 8107-10 and Appendix A, 7 FCC Rcd at 8117-18. Specifically the Commission has proposed moving from the current 25 kHz channel spacing to 6.25 kHz in the 421-512 MHz ("UHF") bands and from 15 kHz channel spacing to 5 kHz in the 150-174 MHz

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16/ As of the date these Comments were filed, legislation that would require reallocation of 200 MHz of federal government spectrum for commercial use was being considered by the Senate and House of Representatives as part of the Budget Reconciliation Bill. See S. 335 and H.R. 707.

(VHF") band. Id. For each band, the ultimate conversion to very narrowband would be accomplished in two stages. The first stage would involve a "channel split" accomplished by reducing channel deviation, reducing noise caused by and to adjacent channel assignments, thereby facilitating addition of new channel assignments, according to the Commission. NPRM, 7 FCC Rcd at 8107, n.7. The second stage would require actual replacement of equipment. Id.

AAR opposes the Commission's proposal for migration to very narrowband because it imposes enormous burdens on PLMR licensees without a sufficient guarantee of spectrum efficiency benefits. Specifically, AAR opposes the deviation reduction requirement for both the UHF and VHF bands and supports an alternative narrowband conversion plan for each band.

A. The Commission's Proposed First-Stage Deviation Reduction Imposes Enormous Burdens on Licensees Without Guaranteed Spectrum Efficiency Gains.

The Commission's proposed requirement that PLMR licensees reduce the deviation of all radio equipment by 1996 will not yield any gains in spectrum efficiency. Moreover, deviation reduction would impose significant expense on licensees and disrupt operations. Although the deviation could be accomplished by "tweaking" the transmitter and not replacing all equipment, it still would be essential to take all equipment out of operation to conduct the required mechanical procedure. The task would require tremendous manpower and administrative coordination to

keep track of which equipment had been adjusted. Thus, the deviation reduction would need to be conducted pursuant to a controlled program and could not be accomplished in the normal equipment maintenance cycle. AAR estimates that, including labor expenses, it would cost more than $9 million to make the required modifications to all its PLMR equipment.[17/]

Further, the deviation reduction would diminish the quality of PLMR communications. Adjusting a transmitter would result in an effective reduction in signal-to-noise in the receiver. Thus, modification of all receivers would be necessary to realize any spectrum efficiency gains. Such modification would be impractical because of the design of existing receivers and, consequently, much more costly and burdensome than the "tweaking" of the transmitters.

B. AAR Supports the LMCC Plan for Conversion to Narrower Channels in the UHF Band.

For the UHF band, the Commission has proposed that all new stations licensed after the effective date of the new PLMR rules (assumed to be January 1, 1994) would operate on 6.25 kHz equipment and that existing licensees would have to convert to 12.5 kHz channelization by January 1, 1996. All licensees would be required to convert to 6.25 kHz bandwidths by January 1, 2004, in the top 15 markets and in smaller markets from 2005 through 2014.

17/ Exhibit 2 tabulates what the proposed deviation reduction would cost the railroad industry.

AAR opposes the Commission's proposal because, like the deviation reduction, it would impose enormous burdens on PLMR licensees with a minimal gain of new channels. Converting to very narrowband channels would require PLMR users to replace all existing equipment and maintain backward compatibility until the conversion was completed. AAR believes that, in addition to the expense of replacing equipment, it would not be prudent to adopt a specific narrowband proposal at this time because it is uncertain what technology will be available so far in the future.

Further, the Commission's proposal does not provide adequate

C. AAR Supports an Offset Overlay Plan for Conversion to Narrower Channels in the VHF Band.

For the VHF band, the Commission has proposed that all new facilities licensed after January 1, 1994, operate on 5 kHz channels.[19/] Stations licensed as of January 1, 1994, would be required to convert to 15 kHz equipment by January 1, 1996, and to 5 kHz bandwidths by January 1, 2004, following the same schedule for stations in the UHF band.[20/]

AAR opposes this plan for the same reasons it opposes the Commission's plan for the UHF band. The Commission's plan would

users could be faced with the expense of replacing equipment twice, or even three times.

Because the Commission's and LMCC's plans pose significant problems, AAR has developed an alternative plan based on an offset overlay channel plan. AAR proposes the following

3. At January 1, 1999

A Further Notice of Proposed Rule Making should be issued to reevaluate very narrowband technology and consider the need to adopt a very narrowband channel plan for congested metropolitan areas and/or a very narrowband efficiency standard, such as X bits per kHz of throughput per square mile.[22/] Any band plan that mandates very narrowband operation in congested areas should

6. At January 1, 2014

In the top 40 metropolitan areas, or in areas deemed congested by the frequency coordinator, all radio operations must be operating with the efficiency equivalent to a very narrowband standard. Users in rural areas may continue to operate wideband equipment on a secondary non-interfering basis.

D. AAR's Offset Overlay Proposal Would Yield More New Channels, Enable Trunking at an Earlier Date and Cost Less Than Other Proposals.

The Commission stated that its overall goal in this proceeding is "to develop a regulatory scheme that increases channel capacity for PLMR users." NPRM, 7 FCC Rcd at 8105-06. In addition, the Commission has emphasized the need to achieve a more spectrum efficient environment through a "reasonable" and "smooth" transition that minimizes costs to users. See, e.g., NPRM, id. at 8106 and 8111. AAR's offset overlay proposal would directly further the Commission's objectives. If implemented, the offset overlay proposal would yield significantly greater spectrum efficiency benefits for PLMR users at less cost than the narrowband proposals of the Commission and LMCC.

1. Create Greater Number of New Channels

As shown in Exhibit 7, the offset overlay channel plan could nearly double the current number of VHF channels as of January 1, 1996, much sooner than a similar number of new channels would be created under the alternative plans. Thus, the offset overlay plan would provide more rapid relief from spectrum congestion.

Moreover, as depicted in Exhibit 8, the offset overlay plan would preserve the option of future migration to a 6.25 kHz band plan if the Commission determines at a later date that such migration is desirable.

2. Enable Trunking at an Earlier Date

By creating additional channels more quickly, the offset overlay plan also would enable PLMR users to implement trunking well in advance of any other proposal. Channel pairs must be available before the major spectrum efficiencies trunking offers can be realized. Under the FCC's plan, trunking would not be a reality until the 2009-2014 period because there would not be enough channels to create unassigned pairs. With the offset overlay plan, trunking would be possible when the equipment is available in 1996.

3. Facilitate "Bandwidth on Demand"

Furthermore, the offset overlay approach would facilitate the creation of "bandwidth on demand" in trunked systems, which would readily accommodate various new wideband digital applications, as shown in Exhibit 9. In the "Standard Channel Operation" represented at the top half of Exhibit 9, the channels above and below the dashed line would operate in a trunking

the minimum amount of spectrum required to transfer the data and select a "target" channel such as that represented by the black dashed line in the channel plan in the lower half of Exhibit 9. The controller would then temporarily "block" channels adjacent to the "target" channel and instruct the "target" channel to transmit the data at the new authorized bandwidth. All channels would return to normal operating conditions once the data transfer was completed.

4. Support Two-Way Conversation on Less Spectrum

For at least the next 10 years, the offset overlay plan would be more efficient than any other plan based on existing equipment or planned technologies. The 5 kHz plan proposed by

out equipment in congested areas where conversion to narrowband is more needed. This benefit would not be available under the plan proposed by the Commission or the Option A approach suggested by the IMSC because both of these result in licensees

for power limits (discussed in Section VII) -- the total cost of the Commission's plan is substantially higher than AAR's offset overlay plan. AAR estimates that implementing the offset overlay plan would cost 57 percent less than implementing the Commission's plan for converting to very narrowband channelization. The summary cost comparisons are shown in Exhibit 11.

By any relevant measure, the benefits of AAR's offset overlay approach greatly exceed those of other proposals. The offset overlay approach would achieve the Commission's goals of creating additional channels, especially in areas where congestion is greatest, thereby enabling other spectrum efficient measures such as trunking. It also would provide users the flexibility to convert to narrowband when warranted by their operations or spectrum requirements in a given geographic area. Finally, it would impose a significantly smaller financial burden on PLMR users. Accordingly, AAR strongly urges the Commission and other PLMR users to seriously consider the offset overlay proposal.

VI. NEWLY CREATED CHANNELS SHOULD REMAIN WITH PLMR USERS THAT IMPLEMENT SPECTRUM EFFICIENCY MEASURES.

The Commission has proposed allotting 258 channel pairs in the 150-162 MHz band, which would become available as a result of very narrowband conversion, for a new Specialized Mobile Radio ("SMR") Service for regional, wide-area voice and data applications. NPRM, 7 FCC Rcd at 8113 and Appendix A, 7 FCC Rcd

at 8120-22. Assuming conversion to narrowband, it is anticipated that every third 5 kHz channel would be allotted for such use. Id.

AAR believes that new channels made available as a result of existing users' conversion to very narrowband should remain with the user group whose "refarming" efforts produced the additional channels. Making PLMR spectrum available to other users would be

designs. Moreover, the Commission's proposal leaves open the possibility of a wide variety of "innovative" uses for the new channels. Such undefined applications by outside users could result in unacceptable interference to adjacent channel users, especially during the "refarming" transition.

VII. THE COMMISSION'S PROPOSED ERP LIMITS FAIL TO TAKE ACCOUNT OF USERS' SPECIALIZED OPERATING REQUIREMENTS.

The Commission has proposed reducing the maximum permitted power levels in order to curtail systems that emit more power than necessary for operations and to permit greater reuse of spectrum in closer geographic areas. NPRM, 7 FCC Rcd at 8112-13. Specifically, the Commission has proposed an effective radiated power ("ERP") limit of 300 watts for licensees in the 150-174 and 450-470 MHz bands, with lower ERP limits for systems with antenna heights above average terrain ("HAAT") greater than 60 meters. Id. All systems in the 150-174 and 450-470 MHz band would be required to meet the new ERP limit by January 1, 1996. NPRM Appendix A, 7 FCC Rcd at 8127.

AAR supports the Commission's objective of ensuring that users be licensed to use no more power than necessary to support their operations. However, AAR opposes the Commission's proposed power limits because they fail to take into account the specialized operating requirements of different PLMR users. A height-adjusted power limit would preclude licensees from designing systems with antenna heights and power limits that are

suited to their particular coverage areas.[24/] As a result, the Commission's proposal actually could impede efficiency by forcing licensees to install additional base stations and duplicate facilities to achieve fill-in coverage. AAR estimates that, for just a representative sample of its member railroads listed in

maximum ERP limit, AAR would support the ERP proposal of the LMCC over the Commission's proposal. Establishing a "safe harbor" would minimize the need to submit coverage contours for each station. Under any approach, the Commission must permit waivers from ERP limits to accommodate train operations through

purchasing equipment from different vendors.

Supplier flexibility and interoperability is especially important to the nation's railroads because of their nationwide interoperability requirement. Although the railroads constitute one nationwide rail network, each railroad is a separate company that must have the flexibility to purchase equipment from the supplier of its choice.

C. PLMR Users Must Be Guaranteed Sufficient Spectrum for Voice Plus Data.

While the railroads will continue to use land mobile frequencies for traditional voice applications, they increasingly are implementing specialized radio applications involving transmission of voice plus data. Some examples of future uses are data links for wayside equipment, mobile data terminals, remote switch indicators and controllers, and RF wayside telephone.[25/] The Commission must ensure that sufficient spectrum is available to accommodate these applications.

25/ See Sections II and IV, discussing railroad requirements for sufficient spectrum to accommodate increasing data applications.

IX. CONCLUSION

AAR supports the Commission's goal of increasing spectrum efficiency in the PLMR bands and is committed to achieving greater efficiency in railroad operations consistent with operational and safety requirements. Trunking is an especially attractive alternative to the railroad industry, and AAR encourages the Commission to ensure that its "refarming" plan create enough additional channels to facilitate immediate implementation of trunking.

AAR strongly urges the Commission to preserve the Railroad Radio Service as a separate service category with AAR as frequency coordinator. The Commission has long recognized the critical safety function of railroad radio communications and the industry's need for dedicated channels. The railroads' unique nationwide interoperability requirement and role in international commerce further justify a separate service category. Accordingly, the Commission should not consolidate railroad frequencies into a pool available to other PLMR users.

AAR believes that its offset overlay plan for the VHF band would result in significantly greater spectrum efficiency benefits sooner, and at lower cost, than the proposals of the Commission and LMCC. AAR's plan could nearly double the number of channels available to users by 1996, providing immediate relief from spectrum congestion and enabling trunking. AAR urges the Commission and other PLMR users to seriously consider the numerous advantages of the offset overlay approach and support it

as the best alternative for achieving the goals of the "refarming" proceeding.

Respectfully submitted,

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May 27, 1993